PATENT SPECIFICATION (11) 1 538 388

1 538 388

(21) Application No. 16050/77 (22) Filed 18 Apr. 1977 (19)
(31) Convention Application No. 2349069 (32) Filed 19 Apr. 1976 in
(33) Soviet Union (SU)
(44) Complete Specification Published 17 Jan. 1979
(51) INT. CL.[2] D03D 1/00
(52) Index at Acceptance
D1K 214 305 309 425 426 66Y
H2E 10B 14 17

(54) IMPROVED WOVEN SWITCHING MATRICES

(71) We, JURY IVANOVICH DANILIN of Leningrad, ulitse Savushkina, 9, kv. 64, USSR, KONSTANTIN AVRAAMOVICH MARINGULOV of Leningrad, ulitsa Lomonosova, 12, kv. 68, USSR, LEONID ANTONOVICH VORONKOV of Leningrad, Lesnoi prospekt, 32, kv. 105, USSR, MIKHAIL NIKOLAEVICH MOKEEV of Leningrad, prospekt Schorsa, 64, kv. 31, USSR and ANATOLY MIKHAILOVICH KHRIPOV of Leningrad, ulitsa Tkaunova, 29, kv. 1003, USSR, all citizens of the USSR, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:-

The present invention relates to electric switching matrices, and more particularly to woven electric switching matrices. The invention can be widely used in a variety of electric and electronic systems to provide electrical interconnections between circuit elements located over the area of a matrix.

The invention can be used the most successfully in modules with point-to-point wiring.

It is expedient to use the present invention in combination with the woven electric switching matrices described in our United States Patent No. 3711627.

In recent years woven electric switching matrices have won wide acceptance, e.g. in a variety of electric and electronic systems incorporating a plurality of circuit elements and their interconnections. Woven matrices have been substituted successfully for the multi-layer printed and point-to-point wirings due to a number of their inherent advantages including a low fabrication cost, adaptability to automation in fabrication, and capability of providing interconnecting circuitry for a large number of circuit elements installed with a high circuit element density.

While the matrix itself is woven automatically by a loom which is controlled by a punch-card program providing the required electrical interconnections of conductors in accordance with the electric circuit diagram of a particular device, the fabrication of connecting leads over the matrix area for connection with terminals of the circuit elements installed on it has been a labour-consuming manual operation which leads to an excessive time consumption when the matrix is manufactured, and, hence, to an increase in its cost.

An object of the invention is to improve woven electric matrices of a known type.

According to the present invention there is provided a woven electric switching matrix comprising an insulating field fabric made by interweaving insulating yarns, conductors interwoven into the insulating field fabric, and sections within the matrix area for the installation of circuit elements, the conductors passing across the sections and intended when severed to form matrix terminals to be electrically connected with terminals of a circuit element installed in the matrix sections, the conductors being led out from the insulating field fabric, fleeted over its surface within a respective said section and re-introduced into the insulating field fabric; the exit points from the insulating field fabric and entrance points into the insulating field fabric for some of said conductors being staggered with respect to the exit points from the insulating field fabric and entrance points into the insulating field fabric for others of said conductors.

It is an advantage of the present invention that it provides a woven electric switching matrix that requires low labour inputs for its subsequent fabrication due to simplification of the operations for forming connecting leads intended for the electrical connection with the terminals of circuit elements to be

installed on the matrix, while maintaining a given circuit element density over the matrix area.

The advantages of the invention arise because, as a result of staggering the exit points from the insulating field fabric of conductors which are intended to form connecting leads over the matrix area, and a similar staggering of their entrance points into the insulating field fabric, the operation of forming the matrix connecting leads is simplified with their required length ensured, since the manual selecting operation is eliminated for the conductors intended to form matrix connecting leads. In use of the matrix of the invention the connecting leads are severed along a line which passes between the points at which the different sets of conductors emerge from the insulating field fabric, as well as along a line passing between the points at which these sets of conductors enter into the insulating field fabric. In one case, for example, all "odd" conducting wires are severed along one side of the section intended for circuit element installation, while all "even" conducting wires are severed along the other side of this section.

Advantages of the present invention will be better understood from the following description taken in conjunction with the accompanying drawings illustrating a preferred embodiment in which:—

Figure 1 represents a woven electric switching matrix which has a section for installation of a circuit element with terminals arranged along its two sides;

Figure 2 represents a woven electric switching matrix which has a section for installation of a circuit element with terminals arranged along its four sides;

Figure 3 is a sectional view taken along line III–III of Figure 2; and

Figure 4 is a sectional view of a woven electric switching matrix with a circuit element installed thereon.

Referring now to Figure 1, a woven electric switching matrix, in accordance with the invention, comprises an insulating field fabric 1 made by interweaving insulating yarns, and conductors 2 interwoven into the insulating field fabric 1, each of the conductors 2 consisting of two wires. The structure of the insulating field fabric 1 with the conductors 2 interwoven therein is described for example, in United States Patent No. 3711627. A section 3 is intended for installation of a circuit element on the matrix. Though only one section 3 is shown in Figure 1, it will be understood that a plurality of such sections 3 are disposed over the matrix area, their number corresponding to the number of circuit elements installed on the matrix. The area of each of the sections 3 is determined by the size of the circuit element to be installed thereon. The conductors 2 are led out from the insulating field fabric 1 at points 4, 5, 6, 7 close to one side of the section 3, floated over the surface of the insulating field fabric 1 within the section 3 and then re-introduced into the insulating field fabric 1 at points 8, 9, 10, 11 close to the opposite side of the section 3. As seen from Figure 1, the points 4, 6 at which one set of conductors, here shown as the "odd" conductors emerge from the insulating field fabric 1 are staggered with respect to the points 5, 7 at which the "even" conductors emerge from the insulating field fabric 1. Similarly, the points 8, 10 at which the "odd" conductors 2 enter the insulating field fabric 1 are staggered with respect to the entrance points 9, 11 the "even" conductors 2 by the same distance as that by which their exit points 4, 5, 6, 7 are staggered, but in the opposite direction so that the lengths of the "odd" and "even" conductor 2 passing across the section 3 are the same.

It is implicit that the words "odd" and "even" are used here to provide a convenient explanation of the invention and that merely respective sets of conductors are intended, regardless of their actual sequence.

The conductors 2 floated over the surface of the insulating field fabric 1 are intended to form matrix connecting leads to be connected to the terminals of a circuit element installed in the section 3. In this case it is supposed that a circuit element with the terminals arranged along its two sides is installed in the section 3. The lengths of the conductors 2 in the section 3 are determined by the required lengths of connecting lead.

Figure 2 shows a woven electric switching matrix where conductors 12 extending at right angles to the direction of the conductors 2 are interwoven into the insulating field fabric 1 in addition to the conductors 2, the section 3 being intended for installation of a circuit element with terminals arranged along all its four sides. In this case, the matrix connecting leads are formed by both the conductors 2 and the conductors 12. The mutual arrangement of the conductors 12 in the section 3 is similar to that of the conductors 2 in the same section, viz. the conductors 12 are led out from the insulating field fabric 1 at points 13, 14, floated over the surface of the insulating field fabric 1 in the section 3 and re-introduced into the insulating field fabric 1 at points 15, 16. The points 13 and 14 are displaced with respect to each other, and the points 15 and 16 are displaced respectively so that the lengths of the conductors 12 passing over the surface of the insulating field fabric 1 are the same.

Figure 3 depicts a sectional view of the matrix shown in Figure 2 in the section 3 for installation of the circuit element.

Prior to installation of the circuit element in the section 3 (Figure 1) the "even" conductors 2 are severed along a line 17 extending between the exit points 4, 6 of the "odd" conductors 2 from the insulating field fabric 1 and the exit points 5, 7 of the "even" conductors 2 from the insulating field fabric 1 and the "odd" conductors along a line 18 extending between the entrance points 8, 10 of the "odd" conductors 2 into the insulating field fabric 1 and the entrance points 9, 11 of the "even" conductors 2 into the insulating field fabric 1. The severance of the said conductors is accomplished along each of the lines 17, 18 simultaneously without their preselection from the entire arrangement of the conductors 2. Only the "odd" or only the "even" conductors 2 are severed on each respective side of the section 3. The lines 17, 18 may be indicated by coloured yarns interwoven in the insulating field fabric 1 to facilitate the identification of the places at which the conductors 2 are to be severed.

According to the embodiment shown in Figure 2, the severance of the conductors 12 is accomplished along lines 19, 20 disposed respectively between the exit points 13, 14 of the conductors 12 from the insulating field fabric 1 and their entrance points 15, 16 into the insulating field fabric 1.

Figure 4 shows a sectional view of the section 3 of the proposed matrix with a circuit element 21 installed thereon, terminals 22 of the circuit element 21 being connected to the connecting leads formed by the severed and bent conductors.

The invention allows the labour of matrix fabrication to be reduced considerably and its cost to be decreased, if one takes into account the fact that similar woven electric switching matrices may be used in complicated electrical and electronic devices incorporating a large number of circuit element.

WHAT WE CLAIM IS:-

1. A woven electric switching matrix comprising an insulating field fabric made by interweaving insulating yarns, conductors interwoven into the insulating field fabric, and sections within the matrix area for the installation of circuit elements, the conductors passing across the sections and intended when severed to form matrix terminals to be electrically connected with terminals of a circuit element installed in the matrix sections, the conductors being led out from the insulating field fabric, floated over its surface within a respective said section and re-introduced into the insulating field fabric, the exit points from the insulating field fabric and entrance points into the insulating field fabric for some of said conductors being staggered with respect to the exit points from the insulating field fabric and entrance points into the insulating field fabric for others of said conductors.

2. A woven electric switching matrix substantially as hereinbefore described with reference to the accompanying drawings.

3. A method of making a switching assembly which comprises weaving a switching matrix in accordance with claim 1 or claim 2, severing the sets of conductors along respective lines intermediate the respective entrance and exit points and connecting the severed conductors to terminals of circuit elements.

A. A. THORNTON & CO.,
Chartered Patent Agents,
Northumberland House,
303/306 High Holborn,
London WC1V 7LE.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1978.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from
which copies may be obtained.

1538388 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

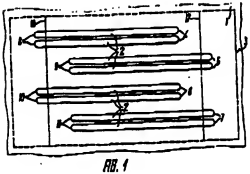

FIG. 1

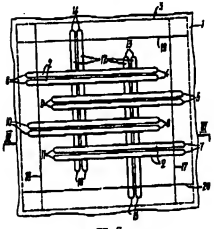

FIG. 2

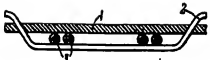

FIG. 3

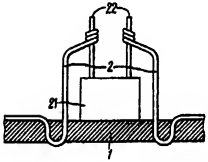

FIG. 4